Delta Engineering
(Firm)
Giffen Mine,
Phase I
Reclamation
Project

FINAL PROJECT REPORT
GIFFEN MINE - PHASE I
RECLAMATION PROJECT

MONT A/E 86-46-117

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FINAL PROJECT REPORT

GIFFEN MINE - PHASE I RECLAMATION PROJECT

MONT A/E 86-46-117

FOR

DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HELENA, MONTANA

BY

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I. INTRODUCTION

The "Giffen" mine is located in Number Five Coulee approximately 4 miles southeast of the town of Stockett in Cascade County, Montana. The main mine site is located in Section 14, T18N, R4E, with additional mine openings located in Sections 22 and 23 of the same township.

A gravel county road runs through the middle of the main site and alongside a wood tipple.

The land adjacent to the mine site is primarily used for cattle grazing with the creek bottom being used for hay lands. The area is part of the upper Sand Coulee Creek drainage with gently sloping valleys, a few trees along the creek bottom, brushy side coulees, and some rock outcrops. The current landowners are Ralph and Eleanor Singles who operate a small cattle ranching operation. There are few houses in the area, although a residence does exist on the north edge of the site. The Singles live 1/4 mile south of the site.

The Giffen mine was operated by the Giffen Mine Company and was reportedly the largest coal mine in the Sand Coulee area with workings extending several miles to the west and south. The exact dates of operation for the mine are unknown, but the mine was believed to have been worked into the early 50s.

The Giffen mine, prior to reclamation, was a large site and included the following problem items that required reclamation construction:

- Numerous collapsed and open mine openings
- A large wooden tipple
- Acid mine drainage from mine opening ~ 250 GPM
- Approximately 18 acres of slack piles, debris, and disturbed areas
- Mine subsidences

The problems associated with the above items included the following:

- Mine openings pose a threat to livestock and people.
- The large slack piles are potentially combustible and are an environmental pollutant.
- The slack and debris are unsightly and are an aesthetic pollutant.
- The slack areas are barren and had created a large unproductive and unuseful area.
- The acid mine drainage had destroyed the soils and vegetation around it and had polluted Five Mile Creek, which in turn polluted Sand Coulee Creek.

- The wooden tipple constitutes an attractive nuisance and safety hazard for people driving beneath it and to persons climbing on the structure.
- The landowner has lost several head of livestock in the subsidences on the property.
- Portions of the slack pile were eroding into Five Mile Creek, causing further degradation of the water quality.

The objective of the project was to define each of the existing problems and either eliminate or mitigate the problem using proven reclamation technology and techniques. This project was titled "Phase I" because this project did not attempt to treat or condition the acid mine drainage discharging from the mine adit. "Phase II" is in the planning stage at this time and will deal exclusively with treatment of the acid mine discharge (AMD) at the site.

The specific objectives of the reclamation project are listed as follows:

A. Permanently close and seal all hazardous mine openings - adits, shafts, subsidences, etc.
B. Eliminate the potential for coal fires in the slack piles.
C. Collect and drain the AMD on the site in preparation for design of the Phase II treatment project.
D. Remove all dangerous mine structures.
E. Improve the aesthetic, commercial and agricultural value of the land and remove the unsightly waste piles and debris from the view of the nearby residents and the travelers along the county road.
F. Reestablish natural vegetation, restore the natural topography, and eliminate all negative impacts of the former mining activities.

II. DESCRIPTION OF RECLAMATION CONTRACT

A. Dates of Contract Schedule

Bid Date	October 23, 1986

Lowest Bidders

1. Shumaker Trucking & Excavating Contractors, Inc.
   Great Falls, Montana
   Bid - $145,693.00
2. Barber Excavating
   Belt, Montana
   Bid - 172,998.00
3. McDaniel & Sons Contractors
   Neihart, Montana
   Bid - 185,096.00

Contractor Award Date	October 27, 1986
Notice to Proceed Date	November 13, 1986
Preconstruction Date	November 24, 1986
Start-up Date(s)	December 1, 1986
Completion Date	April 30, 1987
DSL Supervisor	Mr. Mike Hiel
Consulting Engineer	Delta Engineering Great Falls, Montana
Project Engineer	Mr. Richard West
Project Inspector	Mr. Richard West

DESCRIPTION OF RECLAMATION CONTRACT (CONT'D)

B. List of Equipment Used on the Project

Type	Make & Model	# of Units
Wheel loader	Caterpillar 988	1
Wheel loader	Caterpillar 966	1
Track loader	Caterpillar 977K	1
Backhoe	Case 580C	1
Scraper	Wagner	1
Track tractor	Caterpillar D8	1
Track tractor	Caterpillar D6	1
Motor Grader	Caterpillar	1
Excavator	P&H	1
Belly dump - 26 c.y.	Misc	2
End dump - 22 c.y.	Peterbilt	1
End dump - 12 c.y.	Chevy - Int'l	2
Compressor	Smith	1
Centrifugal pump - 4"	--	1
Centrifugal pump - 2 1/2"	--	1
Centrifugal pump - 6"	--	1
Fuel tank	--	1
Trailer/office	--	1
Farm disc	--	1
3000 gal. Hydroseeder	Bowie	1
Fertilizer Spreader	John Deere	1
Grass Seeder	Brillion	1
Farm Tractor	John Deere	1

C. NARRATIVE OF CONSTRUCTION METHODS

The Giffen mine project was a typical abandoned coal mine with the same type of problems similarly associated with an abandoned mine site. The following is a discussion of the construction methods and means used during the reclamation of the project with emphasis on the unusual items.

The majority of the mine openings were backfilled with on site material to the original ground surface. A large semi-collapsed air shaft (35' to plug, 80' dia @ top) presented a unique problem as the shaft opening was a large cone-shaped hole with a bottom that was plugged with debris and mud. The depth of the shaft beneath the plug was unknown but was reported by the local residents to be very deep. The shaft hole was filled with 500 c.y. of 3' diameter imported rocks and then backfilled with dirt to ground surface. The large rocks were used to form a "bridging plug" across the shaft hole in case of any future collapse in the shaft bottom.

The main adit on the site was completely collapsed, but had an acid mine discharge of 200-300 gpm seeping through the earth plug. The portal was excavated with an excavator & dewatered using centrifugal & diaphragm pumps. A pre-cast concrete drop-box collector was installed at the mouth of the exposed portal. An 8" PVC drain pipe was installed to transport the acid water from the concrete box to the creek below the site. The concrete box and the mine opening were backfilled with gravel to form a collection system similar to an infiltration gallery. The system was backfilled and successfully captured all of the acid mine drainage. A future project, Phase II, will attempt to treat the AMD collected from this system using passive treatment technology.

The large slack piles on the site were dispersed of by contouring in place to form two large disposal areas that blended into the natural topography. The disposal sites and former slack areas were contoured, limed, topsoiled & revegetated.

The Contractor installed a large blade specifically designed to move coal on his D8 tractor. The coal slack piles provided an ideal application for high production slot dozing techniques and this blade was used with great effectiveness on this project.

Lime was hauled to the site in belly dump trucks from the Kaiser Cement Plant in Helena. The lime was applied in windrows and spread with a road grader and dozer. The lime was incorporated into the slack with a farm disc and scarifier teeth.

Topsoil was obtained from areas close to the project and hauled by trucks to the site. The landowner was paid a royalty of $0.60/c.y. for his topsoil.

The original contract did not include any topsoil for the former slack areas, and it was apparent that the ground would be too rocky to reestablish vegetation. A change order was initiated to provide topsoil for all disturbed areas on the project.

The wooden tipple was dismantled with a loader and the timbers hauled to the landowner's house at his request. Various culverts and ditches were installed to control surface water on the site.

All disturbed areas were reseeded with a Brillion grass seeder and mulched with Hydromulch. Wire fence was erected to protect the reseeded areas from cattle.

III. Cost Summary

A. Construction Costs - Itemized

This contract was bid as a lump-sum contract. The contract included an approximate estimate for each lump sum item and these quantities will be used to arrive at a unit cost for each item for comparison purposes. Change order items were paid for as a unit price item.

Item Description	Estimated Quantity	Actual lump Sum Bid Price	Estimated Cost/Unit
Slack Removal (Dozer Push)	43,600 c.y.	15,260.00	$0.71/c.y.
Contour in Place	15,575 c.y.	3,393.75	0.50/c.y.
Topsoil Borrow & Place (incl. Royalty)	8,000 c.y.	14,000.00	5.00/c.y.
Excavate & Haul Soil	3,225 c.y.	2,418.75	1.50/c.y.
Adit Backfill	7 EA.	2,100.00	300.00/EA.
Shaft Backfill	4 EA.	800.00	200.00/EA.
Lime Application @ 20 Tons/ac.	7.33 AC.	733.00	800.00/AC.
Lime Application @ 10 Tons/ac.	5.50 AC.	550.00	400.00/AC.
Riprap Ditch	240 L.F.	5,520.00	23.00/L.F.
V-Ditch	1695 L.F.	508.50	0.30/L.F.
Revegetation	18.58 L.F.	9,290.00	1000/AC.
3-Wire Fence	8,320 L.F.	11,814.00	1.42/L.F.
8" PVC - CL. 160	300 L.F.	3,300.00	11.00/L.F.
Seepage Collector System	1 EA.	68,096.60	3716.60/EA.
Culvert - 24 L.F. of 12" C.S.P.	1 L.S.	408.00	408.00/EA.
Culvert - 46 L.F. of 18" C.S.P.	1 L.S.	1,150.00	1150.00/EA.
Debris & Mine Car Disposal	1 L.S.	1,600.00	1600.00/L.S.
12"-36" dia. Rock Fill	500 c.y.	1,750.00	3.50/c.y.
Dismantle Tipple	1 EA.	3,000.00	3000.00/L.S.

TOTAL LUMP SUM BID PRICE = $145,693.00
FOR ORIGINAL CONTRACT

Change Order #1 Itemization

Additional Fence @ Brodie Site - 247 L.F. @ $1.42/L.F.=	350.74
Additional Topsoil @ Giffen - 3740 c.y. @ $3.50/c.y.=	13,090.00

Change Order #2 Itemization

Delete Concrete Footing for Fan Memorial	(1,000.00)
TOTAL CHANGE ORDERS	$ 12,440.74
TOTAL AMOUNT OF CONSTRUCTION CONTRACT	$158,133.74

The Contractor purposely submitted a bid schedule with the itemizing scrambled to prevent other contractors from obtaining his actual item costs for the work. The itemized list above shows their actual lump sum bid items, but the unit prices shown were the realistic prices that the contractor actually used in arriving at a lump sum price for the entire job.

ATTACHMENT I

ANALYSIS OF CONSULTANT COSTS

PROJECT NAME: Giffen Mine - Phase I
PROJECT NO.: MONT A/E 86-46-117
DATE PREPARED: June, 1987

SERVICE	AMOUNT
ENGINEERING DESIGN	
1985	7,566
1986	14,793
SUBTOTAL ENGINEERING DESIGN:	$ 22,359
CONSTRUCTION INSPECTION AND ADMINISTRATION	
1986	16,137
SUBTOTAL CONSTRUCTION INSP. & ADMIN.	$ 16,137
TOTAL PROJECT ENGINEERING COST:	$ 38,496
TOTAL CONSTRUCTION COST:	$158,134

COST COMPARISON - PROJECT ENGINEERING/CONSTRUCTION

ENGINEERING DESIGN/CONSTRUCTION	14.14
CONSTRUCTION INSP. & ADMIN./CONSTRUCTION	10.20
TOTAL PROJECT ENGINEERING/CONSTRUCTION	24.34

IV. - SUMMARY AND COMMENT ON THE JOB

The Giffen Project accomplished all of the goals that were listed earlier in this report. The entire area has been transformed from a large barren mine waste site to a natural looking pasture and hillside.

The items of the Project Design that could have been improved include the following:

- Concrete collector drop-boxes should be sized after exposing the adits to insure that the box isn't too small for the adit opening.
- All former slack areas should probably be newly topsoiled as the existing soil is usually contaminated and the ground below unsuitable for reseeding.

The items of Construction Procedures/Inspection that caused some problems and are worthy of comment include the following:

- Never allow frozen slack material to be used as backfill, it will consolidate when it thaws. Material that appears loose may have ice crystals among the grains.
- The contractor should be informed that all Hydroseeder tracks are to be removed before the job is complete.

The Project as a whole appeared exceptionally good after construction completion. The "Brillion" seeder used to reseed the area removed all of the clods in the topsoil and put a nice finish on the surface.

The landowners, Ralph and Eleanor Singles, were extremely pleased with the reclamation. They agreed to allow a large air fan/mine relic to be rejuvenated, painted, and placed as a monument in the community of Centerville.

All revegetation operations were completed by April 30, 1987 and the Project was accepted and approved and final payment was made at that time.